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Function Description

1 General information on the Oxylog 1000

The Oxylog 1000 is a time-controlled, volume-constant emergency and transport ventilator for patients weighing 7.5 kg or above. The Oxylog 1000 has the operating mode: controlled ventilation (IPPV = Intermittent Positive Pressure Ventilation).



Fig. 1: Front view of the Oxylog 1000

2 Components of the Oxylog 1000

The Oxylog 1000 comprises the following components:

- Pressure reducer
- ON/OFF switch
- Inspiratory/expiratory switching valve
- Minute volume control valve
- Frequency control
- Safety valve
- Emergency air valve
- Pressure gauge
- Injector
- Vent valve
- Air Mix/No Air Mix selector switch
- Logic circuit for disconnect alarm and stenosis alarm
- Alarm silence

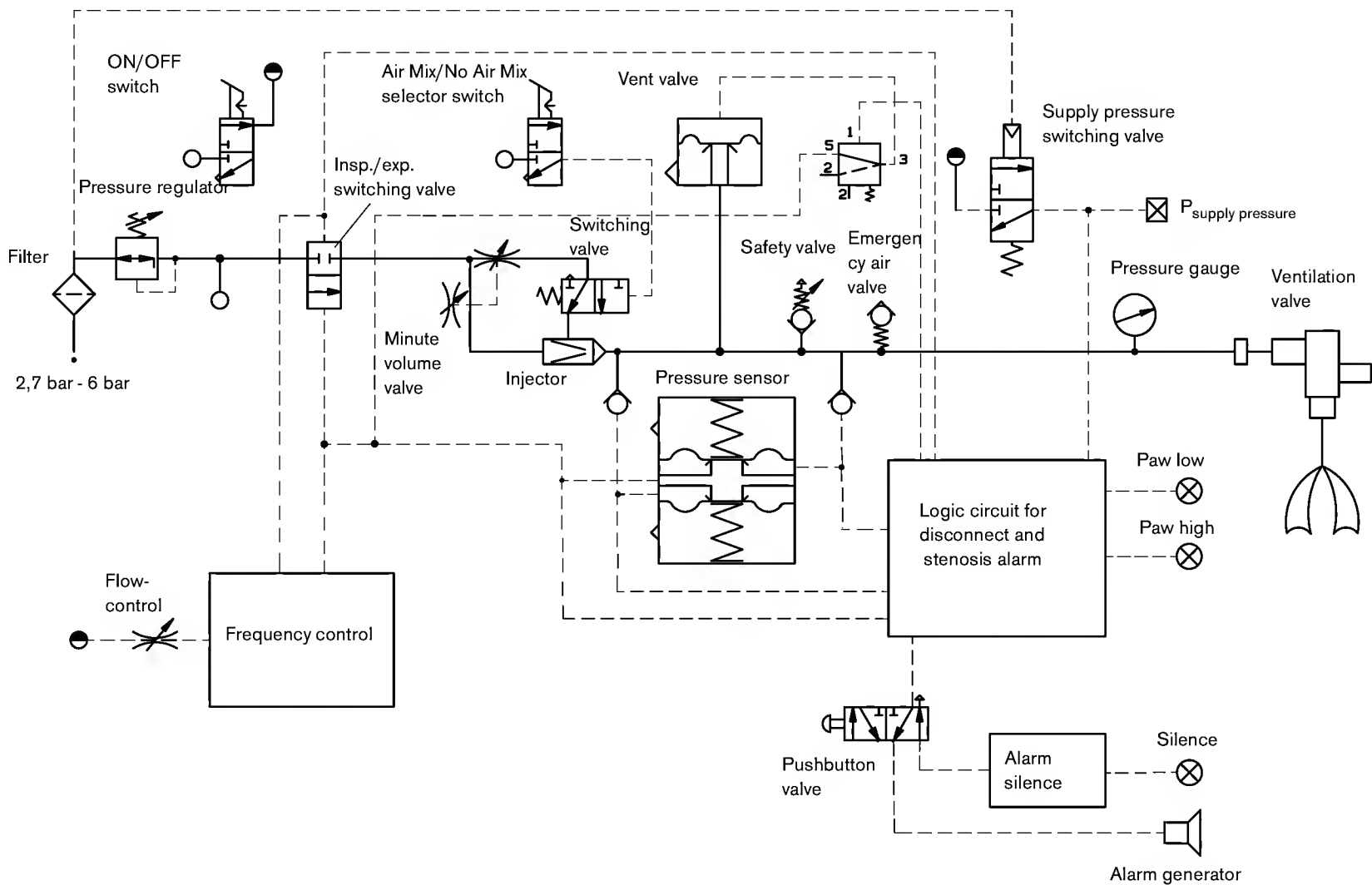


Fig. 2: Block diagram of the Oxylog 1000

3 Pneumatic Control (old Oxylog 1000)

3.1 Gas Supply

The compressed gas is supplied from the central supply system (CS) or from an O₂ cylinder with pressure regulator. The operating pressure of the Oxylog 1000 is between 2.7 bar and 6 bar.



Risk of damage to equipment! Dust, oil and humidity in medical gases may impair the functioning of the equipment or damage it. **Use only dust-free, oil-free and dry medical gases.**

The supply gas flows via the port (A1), the filter (F1) and the pressure regulator (DR1) to the manifold (O). The pressure regulator (DR1) regulates the pressure of the supply gas to 1.5 bar.

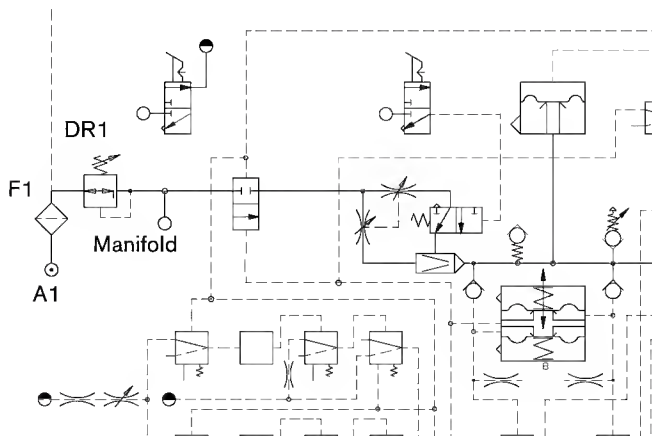




Fig. 3: Segment of the flow chart: Supply gas inlet

3.2 Frequency Control

When the unit is off, driving gas flows via the manifold  and through the dosage valve DS to the 3/2-way valve DMR5 and to DMR 6. In consequence, DMR6 switches through and the switching valve WV1 switches to expiration. At the same time DMR1 is switched; DMR2 is vented via the volume V1 and DMR1.

If the switch S1 is switched, the gas flows via the manifold  to D5, the frequency control valve FD1, and to DMR 1 and 4. DMR4 fills V2, and DMR5 is switched with a delay; this vents DMR 6, 4 and 1. At the same time, DMR3 is switched over via D1 and DMR2, and WV1 switches to inspiration. Vent valve EV is closed via DMR18.

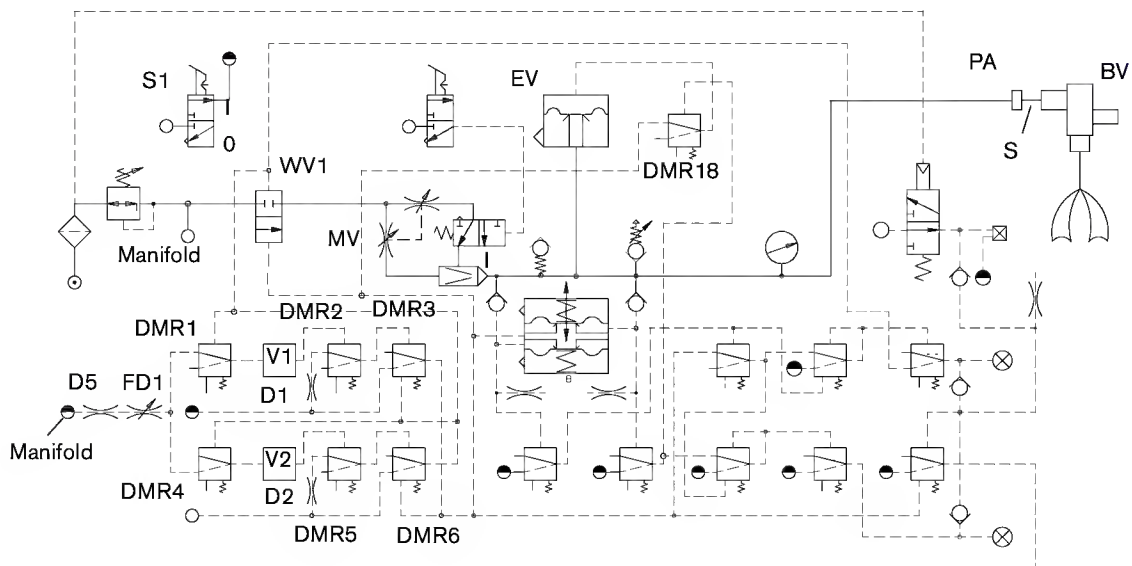


Fig. 4: Segment of the flow chart: Frequency Control

During the inspiration phase, the supply gas flows through the switching valve (WV1 - see illustration above), the minute volume control valve (MV), the injector (I), the patient connection port (PA), the hose system (S) and the ventilation valve (BV) to the patient.

During expiration, the vent valve (EV) is open to the atmosphere, so that pressure is relieved from the hose system (S) and the ventilation valve (BV); the patient can breathe out through the expiration branch of the ventilation valve (BV) to atmosphere.

3.3 Air Mix/No Air Mix Selector Switch

The setting of the Air Mix/No Air Mix selector switch determines the O_2 concentration of the supply gas for the patient.

When the Air Mix/No Air Mix selector switch is set to "Air Mix", the injector (I) takes in ambient air through the 3/2-way valve (WV2). The O_2 concentration of the supply gas for the patient is approx. 50 vol.% O_2 .

When the Air Mix/No Air Mix selector switch is set to "No Air Mix", the injector (I) takes in the supply gas through the 3/2-way valve (WV2). The O_2 concentration of the supply gas for the patient is approx. 100 vol.% O_2 .

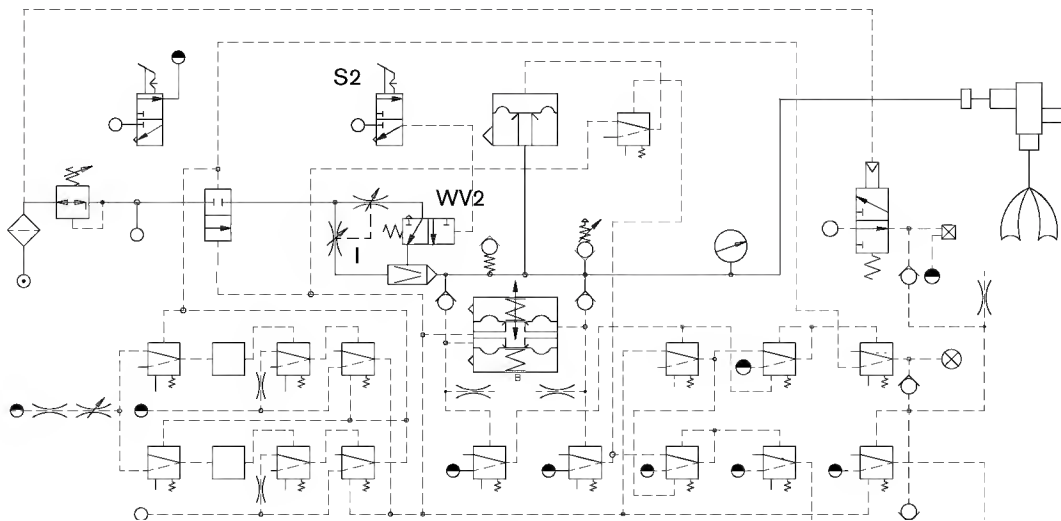


Fig. 5: Segment of the flow chart: Air Mix/No Air Mix selector switch

3.4 Safety Devices

The Oxylog 1000 has the following safety devices:

- Mechanical safety valve
- Pressure gauge
- Emergency air valve
- Disconnect alarm
- Stenosis alarm
- Alarm warning of failure of the compressed gas supply
- Alarm silence

3.4.1 Mechanical Safety Valve

The mechanical safety valve limits the ventilation pressure to approx. 80 mbar.

3.4.2 Pressure Gauge

The pressure gauge indicates the current airway pressure during the inspiration phase. The display range is -10 mbar to 80 mbar.

3.4.3 Emergency Air Valve

The spontaneously breathing patient can breathe in ambient air through the emergency air valve if the Oxylog 1000 has failed due to a fault.

3.4.4 Disconnect Alarm

The disconnect alarm (P_{aw} low) warns of a pressure drop in the patient gas. The disconnect alarm is triggered under the following conditions:

- The hose system connection to the patient is interrupted
- The ventilation valve is incorrectly fitted or damaged
- The cuff has a leak
- Internal device error

If the ventilation pressure is less than 10 mbar (disconnect condition), the 3/2-way valve (DMR7 - see illustration above) is not triggered. That is, the 3/2-way valves (DMR9 and DMR10) operate the 3/2-way valve (DMR11). During the expiration phase the indicator (P_{aw} low) visually indicates the disconnection and the alarm generator (L1) delivers an audible warning.

If the ventilation pressure is higher than 10 mbar, the 3/2-way valve (DMR7) switches. The 3/2-way valves (DMR9, DMR10 and DMR11) vent to atmosphere. The visual and audible alarms are suppressed.

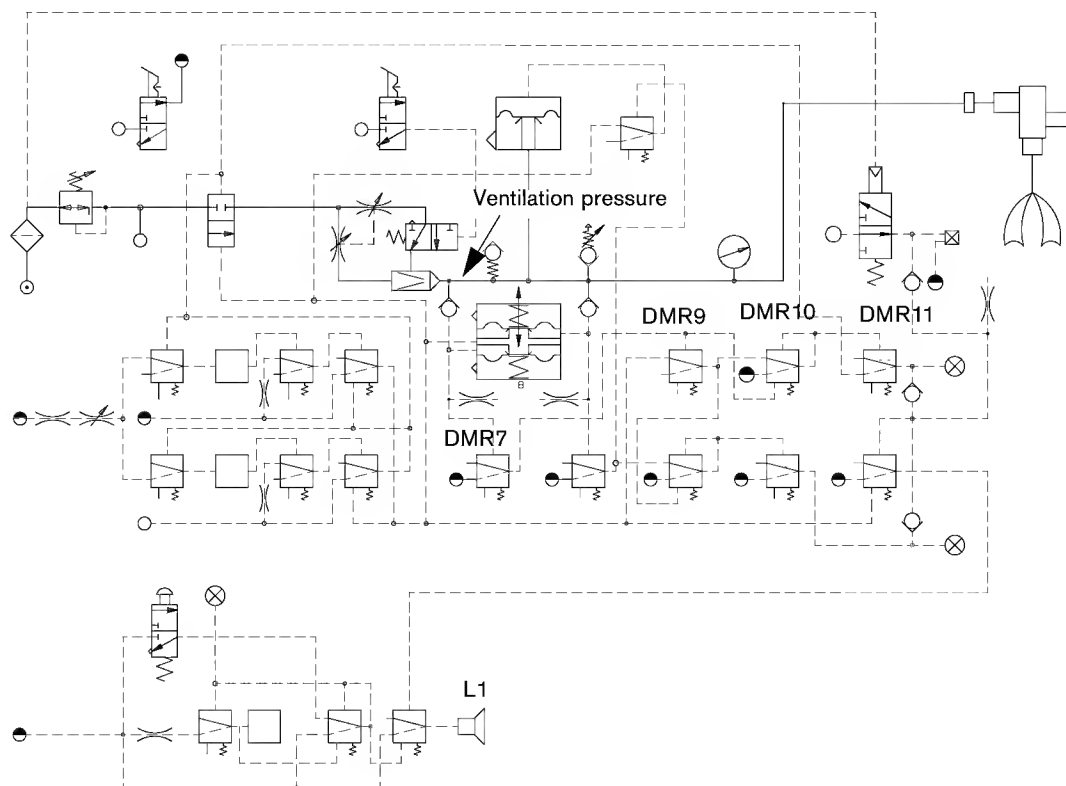


Fig. 6: Flow chart of the Oxylog 1000: Disconnect Alarm

3.4.5 Stenosis Alarm

The stenosis alarm (Paw high) warns of a high airway pressure in the patient branch. The stenosis alarm is triggered under the following conditions:

- The patient's airways are blocked
- The ventilation hose is kinked
- The lung compliance is reduced
- The patient "fights" the ventilator

If the ventilation pressure is equal to or higher than 10 mbar, but the alarm limit (30 mbar to 60 mbar) is pre-set lower, the 3/2-way valve (DMR8) is not triggered. The 3/2-way valves (DMR 12 and DMR13) vent through the 3/2-way valve (DMR8).

If the ventilation pressure exceeds the pre-set alarm limit, the 3/2-way valve (DMR8) activates the 3/2-way valves (DMR 12 and DMR13). The 3/2-way valve (DMR13) activates the "Paw high" indicator (Z3) and the 3/2-way valve (DMR14) activates the alarm generator (L1). At the same time the 3/2-way valve (DMR8) switches the 3/2-way valve (DMR18). The vent valve (EV) opens the supply gas path to atmosphere.

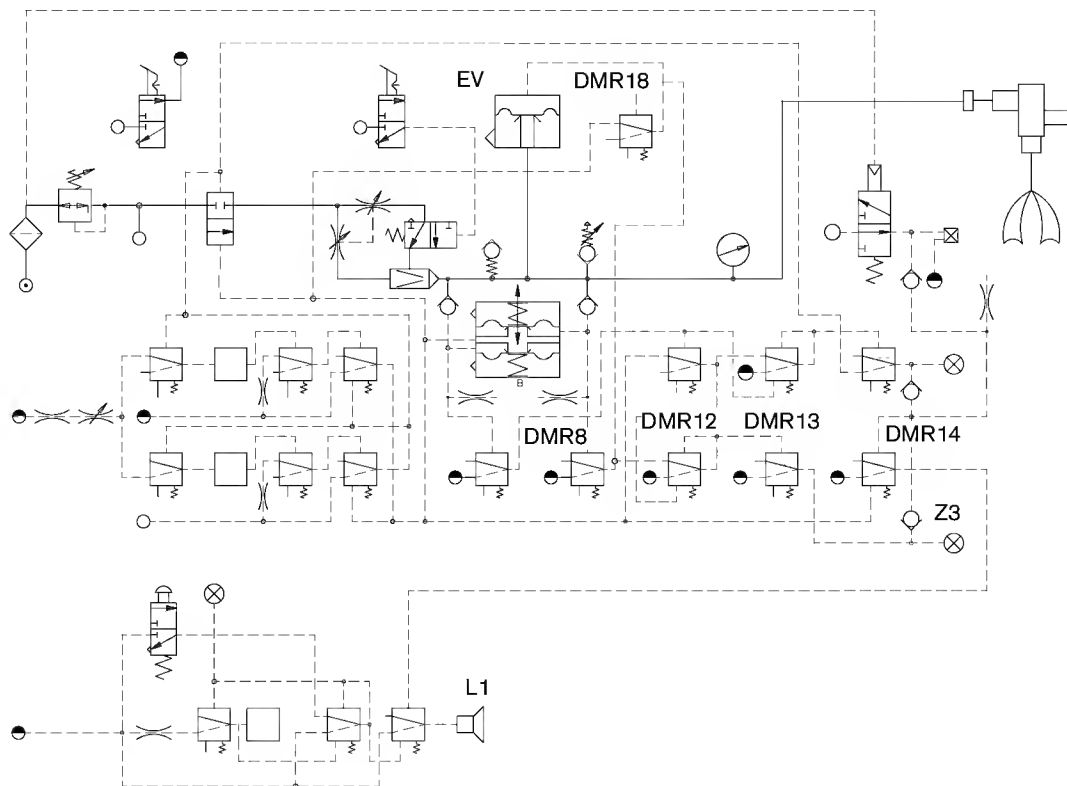


Fig. 7: Flow chart of the Oxylog 1000: Stenosis alarm

3.4.6 Gas Supply Failure Warning (Pv)

If the gas supply fails or falls below a defined pressure, the Oxylog 1000 delivers two alarms:

- Visual alarm indicator "Pv"
- Audible alarm (alarm generator)

The alarm is triggered under the following conditions:

- The pressure of the gas supply from the central supply system or from the O₂ cylinder is inadequate or absent
- The valve of the O₂ cylinder is closed
- The gas supply connector is incorrectly installed

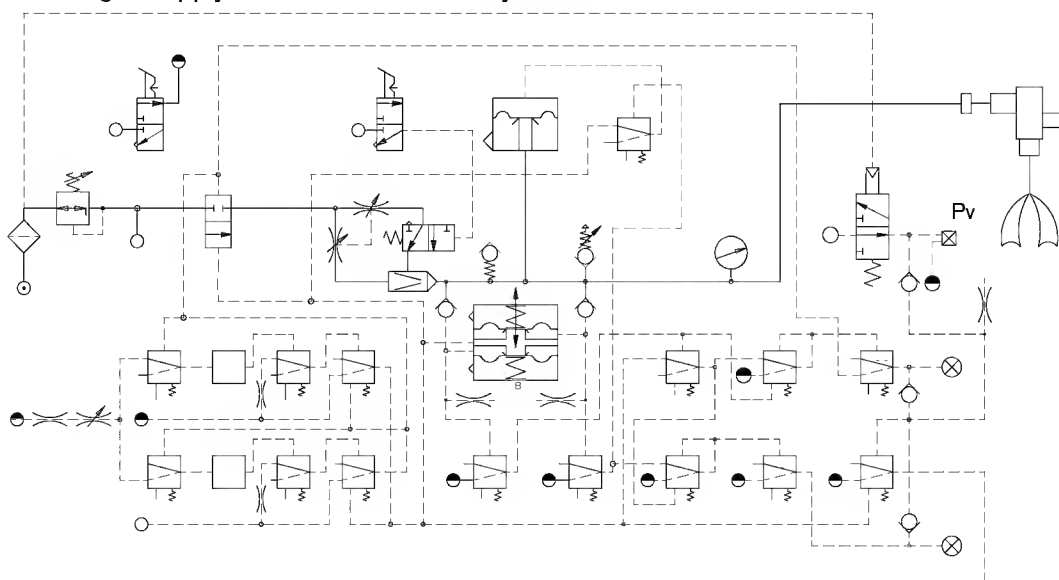


Fig. 8: Segment of the flow chart: Gas supply failure alarm

3.5 Alarm Silence

When the pushbutton valve (T1) is pressed the 3/2-way valve (DMR15) fills the volume (V3) and activates the 3/2-way valve (DMR16). The 3/2-way valve (DMR17) vents the alarm generator (L1) is inactive up to the switching point of the volume (V3).

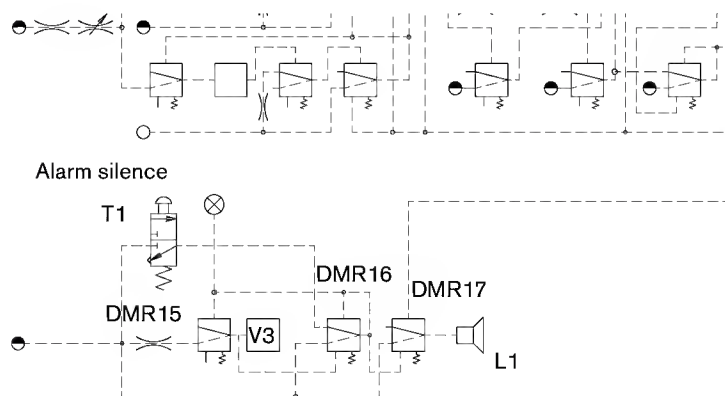


Fig. 9: Segment of the flow chart: Alarm silence

3.6 Pressure Sensor

The pressure sensor comprises two diaphragms. The ventilation pressure acts on the undersides of the diaphragms. The supply pressure (Insp.) is centered on the craters on the pressure sensor during the inspiration phase. The built-in mechanical springs in the pressure sensor exert different forces on the diaphragms:

- Non-adjustable spring force (10 mbar)
- Spring force adjustable (30 mbar to 60 mbar) with the alarm control valve

One or other of the diaphragms is raised according to the respective compensation pressures on the mechanical springs.

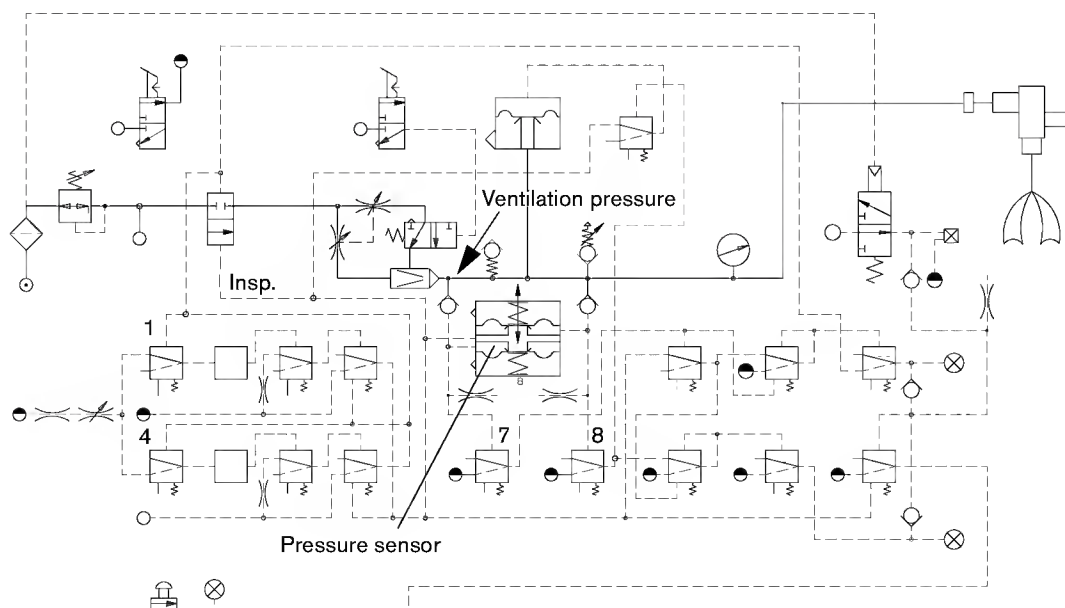


Fig. 10: Segment of the flow chart: Pressure sensor

4 Location of Oxylog 1000 (old) Assemblies

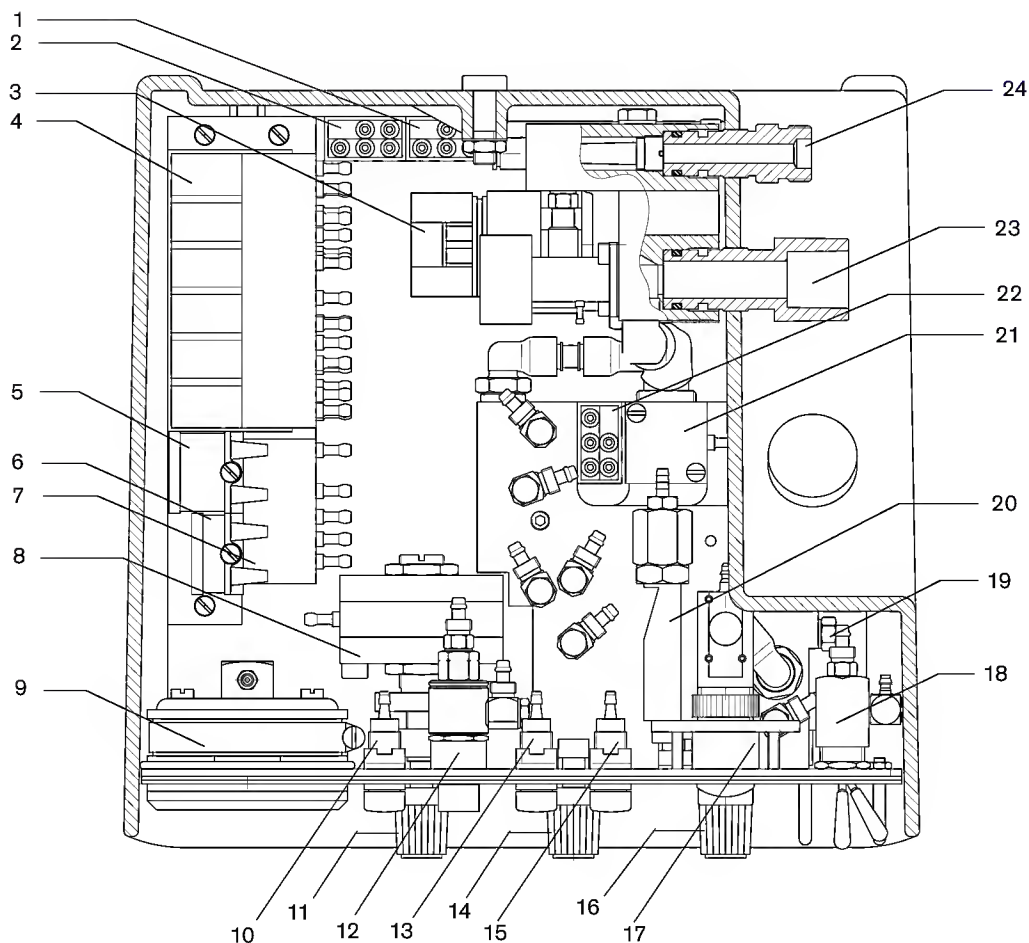


Fig. 11: Top view of the open Oxylog 1000 (old)

Key

1	3/2-way valve (DMR 7)	9	Pressure gauge	17	Indicator (Pv)
2	3/2-way valve (DMR 8)	10	Indicator (Silence)	18	Air Mix/No Air Mix
3	Pressure regulator	11	Alarm control valve	19	On switch
4	Alarm logic (under frequency control)	12	Silence button	20	Patient block
5	Volume (expiration)	13	Indicator (Paw low)	21	Vent valve
6	Volume (inspiration)	14	Frequency control valve	22	DMR 18
7	Alarm silence	15	Indicator (Paw high)	23	Patient connection port
8	Pressure sensor (double-diaphragm switch)	16	MV control valve	24	Gas connection port

5 Pneumatic Control (new Oxylog 1000)

5.1 Gas Supply

The compressed gas is supplied from the central supply system (CS) or from an O₂ cylinder with pressure regulator. The operating pressure of the Oxylog 1000 is between 2.7 bar and 6 bar.



Risk of damage to equipment! Dust, oil and humidity in medical gases may impair the functioning of the equipment or damage it. **Use only dust-free, oil-free and dry medical gases.**

The supply gas flows via the port (A1), the filter (F1) and the pressure regulator (DR1) to the manifold (VL). The pressure regulator (DR1) regulates the pressure of the supply gas to 1.5 bar.

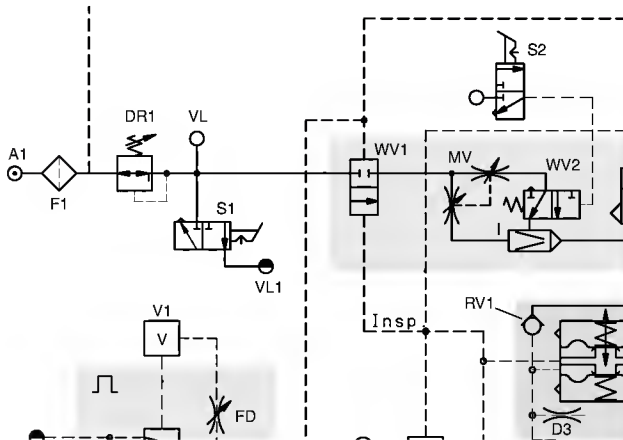


Fig. 12: Segment of the flow chart: Supply gas inlet

5.2 Frequency Control

When the unit is switched off, valve WV1 and switch S1 are closed. No ventilation is carried out and there is no pressure at the frequency control.

If Oxylog 1000 is switched on using switch S1, the gas flows through switch S1 and manifold VL1 to DMR1 and DMR2 of the frequency control. The gas flows through valve DMR1 to the frequency adjusting valve FD and to the control connection of DMR2. DMR2 switches. The gas flows to DMR3 and WV1. DMR3 and WV1 switch. Inspiration is carried out.

The volume V1 is filled through the frequency adjusting valve FD. Depending on how the frequency adjusting valve FD is set, the volume V1 is filled faster or slower thus determining the duration of the inspiration. As soon as volume V1 is filled, DMR1 switches thereby switching also DMR2. The gas present at DMR3 and WV1 can escape through DMR2. DMR3 and WV1 switch. Expiration starts.

The gas contained in the volume escapes through the frequency adjusting valve FD and DMR1. Depending on how the frequency adjusting valve FD is set, the volume V1 is emptied faster or slower thus determining the duration of the expiration. As soon as the volume is empty, DMR1 switches. The expiration phase is over and the procedure restarts.

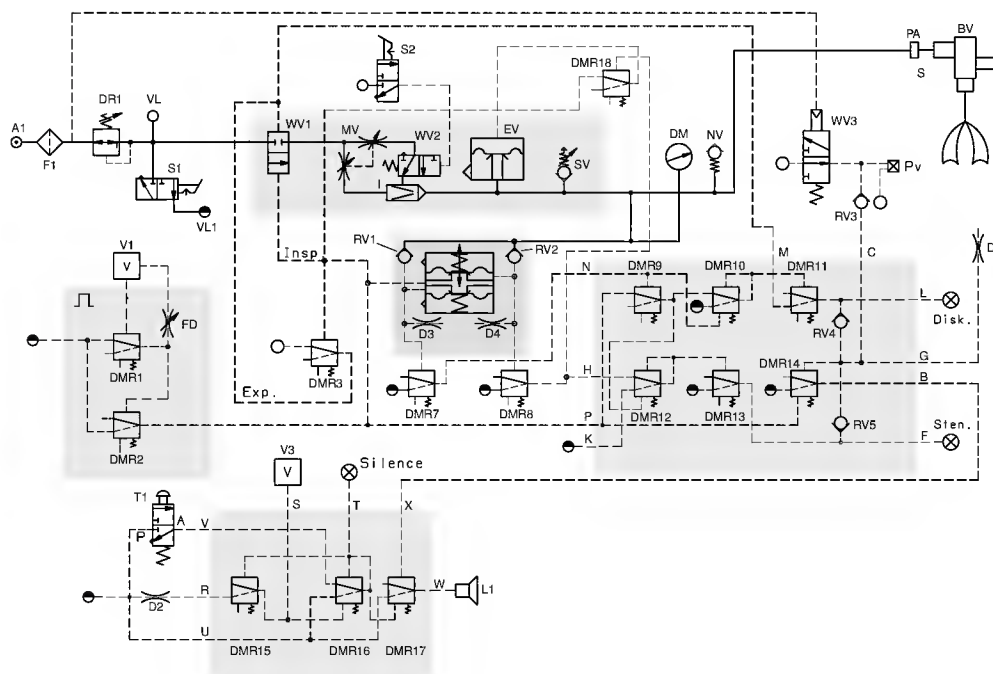


Fig. 13: Segment of the flow chart: Frequency control

5.3 Air Mix/No Air Mix Selector Switch

The setting of the Air Mix/No Air Mix selector switch determines the O_2 concentration of the supply gas for the patient.

When the Air Mix/No Air Mix selector switch is set to "Air Mix", the injector (I) takes in ambient air through the 3/2-way valve (WV2). The O_2 concentration of the supply gas for the patient is approx. 50 vol.% O_2 .

When the Air Mix/No Air Mix selector switch is set to "No Air Mix", the injector (I) takes in the supply gas through the 3/2-way valve (WV2). The O_2 concentration of the supply gas for the patient is approx. 100 vol.% O_2 .

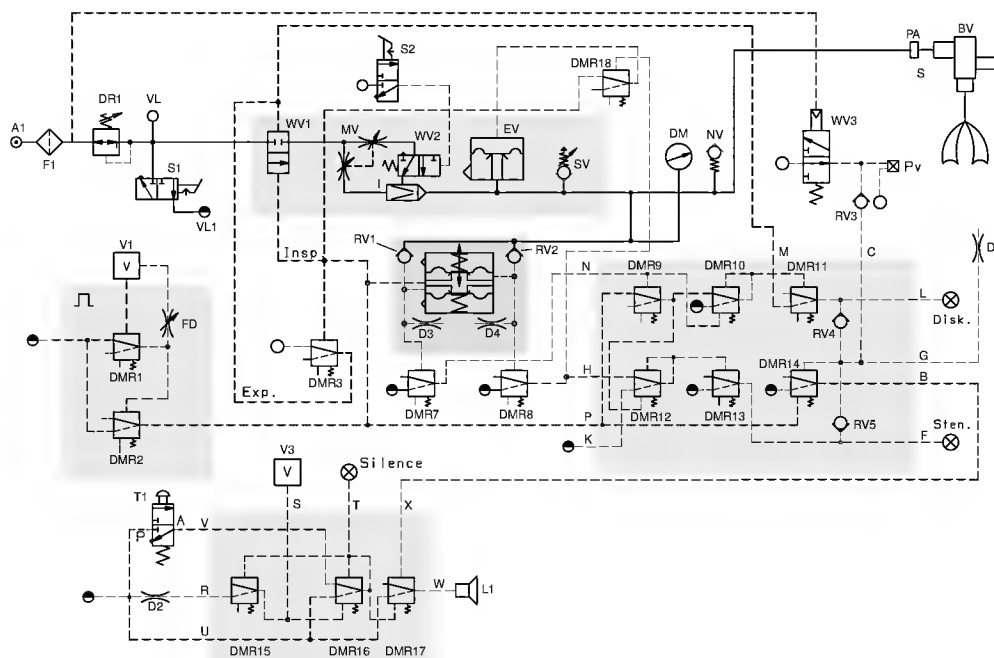


Fig. 14: Segment of the flow chart: Air Mix/No Air Mix selector switch

5.4 Safety Devices

The Oxylog 1000 has the following safety devices:

- Mechanical safety valve
- Pressure gauge
- Emergency air valve
- Disconnect alarm
- Stenosis alarm
- Gas supply failure alarm
- Alarm silence

5.4.1 Mechanical Safety Valve

The mechanical safety valve limits the ventilation pressure to approx. 90 mbar.

5.4.2 Pressure Gauge

The pressure gauge indicates the current airway pressure during the inspiration phase. The display range is -10 mbar to 80 mbar.

5.4.3 Emergency Air Valve

The spontaneously breathing patient can breathe in ambient air through the emergency air valve if the Oxylog 1000 has failed due to a fault.

5.4.4 Disconnect Alarm

The disconnect alarm (P_{aw} low) warns of a pressure drop in the patient gas. The disconnect alarm is triggered under the following conditions:

- The hose system connection to the patient is interrupted
- The ventilation valve is incorrectly fitted or damaged
- The cuff has a leak
- Internal device error

If the ventilation pressure is less than 10 mbar (disconnect condition), the 3/2-way valve (DMR7 - see illustration above) is not triggered. That is, the 3/2-way valves (DMR9 and DMR10) operate the 3/2-way valve (DMR11). During the expiration phase the indicator (P_{aw} low) visually indicates the disconnection and the alarm generator (L1) delivers an audible warning.

If the ventilation pressure is higher than 10 mbar, the 3/2-way valve (DMR7) switches. The 3/2-way valves (DMR9, DMR10 and DMR11) vent to atmosphere. The visual and audible alarms are suppressed.

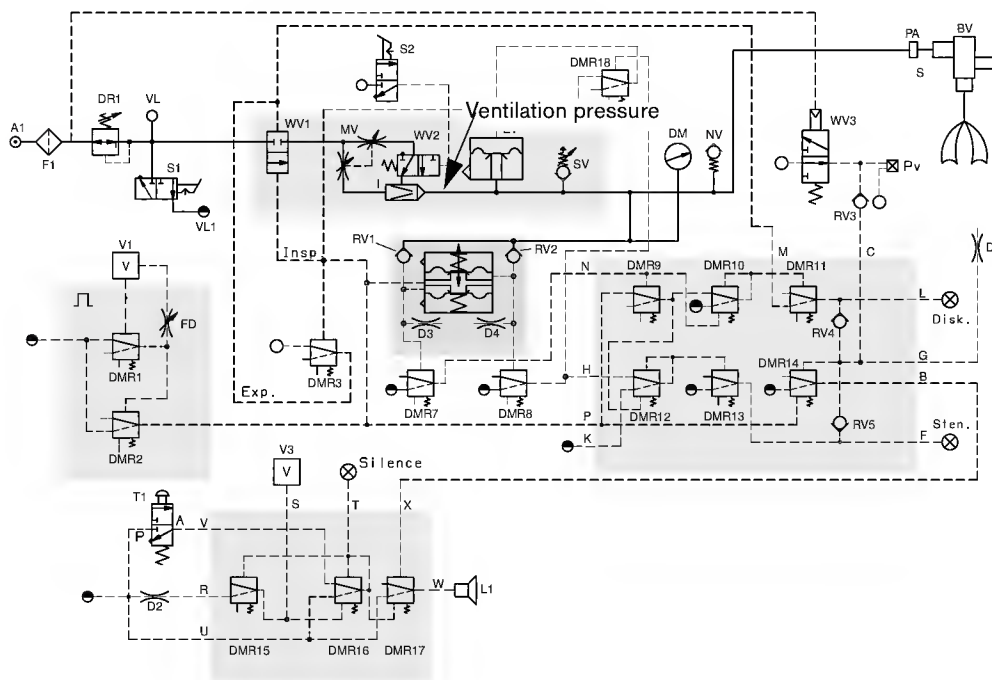


Fig. 15: Flow chart of the Oxylog 1000: Disconnect alarm

5.4.5 Stenosis Alarm

The stenosis alarm (Paw high) warns of a high airway pressure in the patient branch. The stenosis alarm is triggered under the following conditions:

- The patient's airways are blocked
- The ventilation hose is kinked
- The lung compliance is reduced
- The patient "fights" the ventilator

If the ventilation pressure is equal to or higher than 10 mbar, but the alarm limit (30 mbar to 60 mbar) is pre-set lower, the 3/2-way valve (DMR8) is not triggered. The 3/2-way valves (DMR 12 and DMR13) vent through the 3/2-way valve (DMR8).

If the ventilation pressure exceeds the pre-set alarm limit, the 3/2-way valve (DMR8) activates the 3/2-way valves (DMR 12 and DMR13). The 3/2-way valve (DMR13) activates the "Paw high" indicator (Z3) and the 3/2-way valve (DMR14) activates the alarm generator (L1). At the same time the 3/2-way valve (DMR8) switches the 3/2-way valve (DMR18). The vent valve (EV) opens the supply gas path to atmosphere.

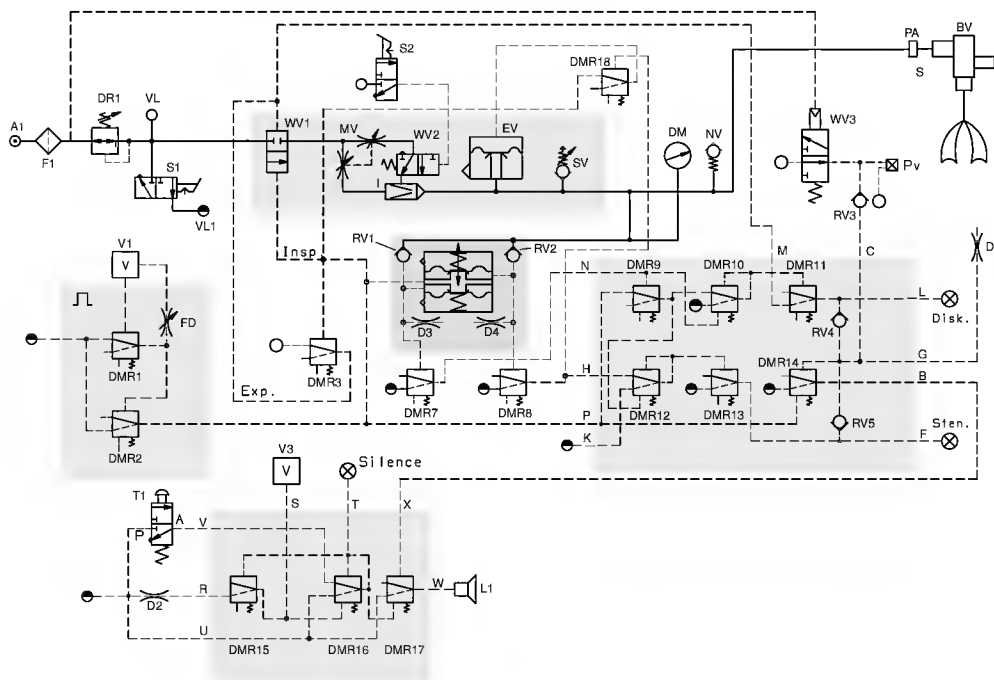


Fig. 16: Flow chart of the Oxylog 1000: Stenosis alarm

5.4.6 Gas Supply Failure Warning (Pv)

If the gas supply fails or falls below a defined pressure, the Oxylog 1000 delivers two alarms:

- Visual alarm indicator "Pv"
- Audible alarm (alarm generator)

The alarm is triggered under the following conditions:

- The pressure of the gas supply from the central supply system or from the O₂ cylinder is inadequate or absent
- The valve of the O₂ cylinder is closed
- The gas supply connector is incorrectly installed

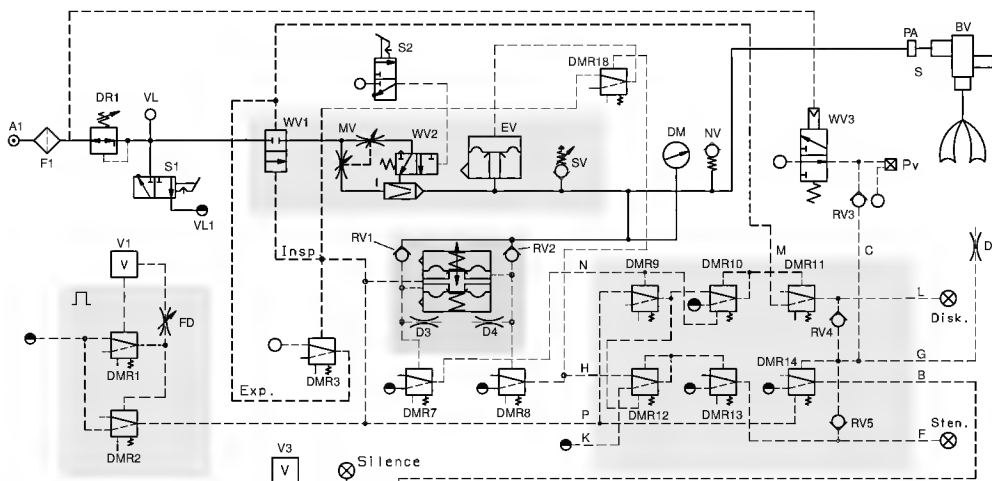


Fig. 17: Segment of the flow chart: Gas supply failure alarm

5.5 Alarm Silence

When the pushbutton valve (T1) is pressed the 3/2-way valve (DMR15) fills the volume (V3) and activates the 3/2-way valve (DMR16). The 3/2-way valve (DMR17) vents the alarm generator (L1) to atmosphere. The alarm generator (L1) is inactive up to the switching point of the volume (V3).

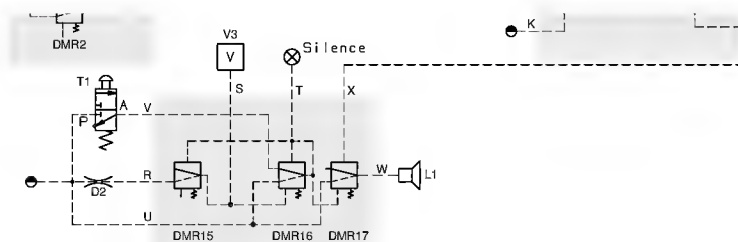


Fig. 18: Segment of the flow chart: Alarm silence

5.6 Pressure Sensor

The pressure sensor comprises two diaphragms. The ventilation pressure acts on the undersides of the diaphragms. The supply pressure (Insp.) is centered on the craters on the pressure sensor during the inspiration phase. The built-in mechanical springs in the pressure sensor exert different forces on the diaphragms:

- Non-adjustable spring force (10 mbar)
- Spring force adjustable (30 mbar to 60 mbar) with the alarm control valve

One or other of the diaphragms is raised according to the respective compensation pressures on the mechanical springs.

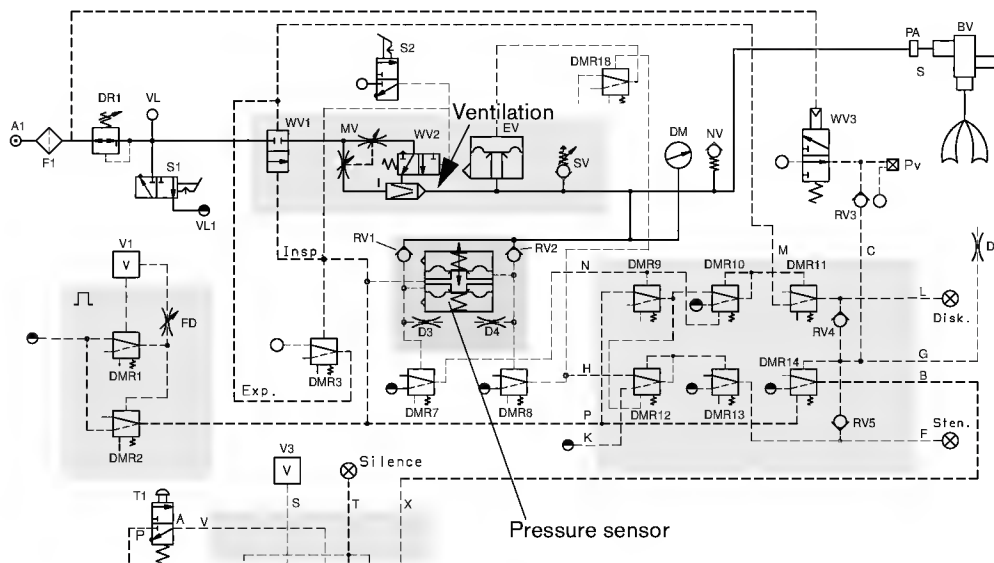


Fig. 19: Segment of the flow chart: Pressure sensor

6 Location of Oxylog 1000 (new) Assemblies

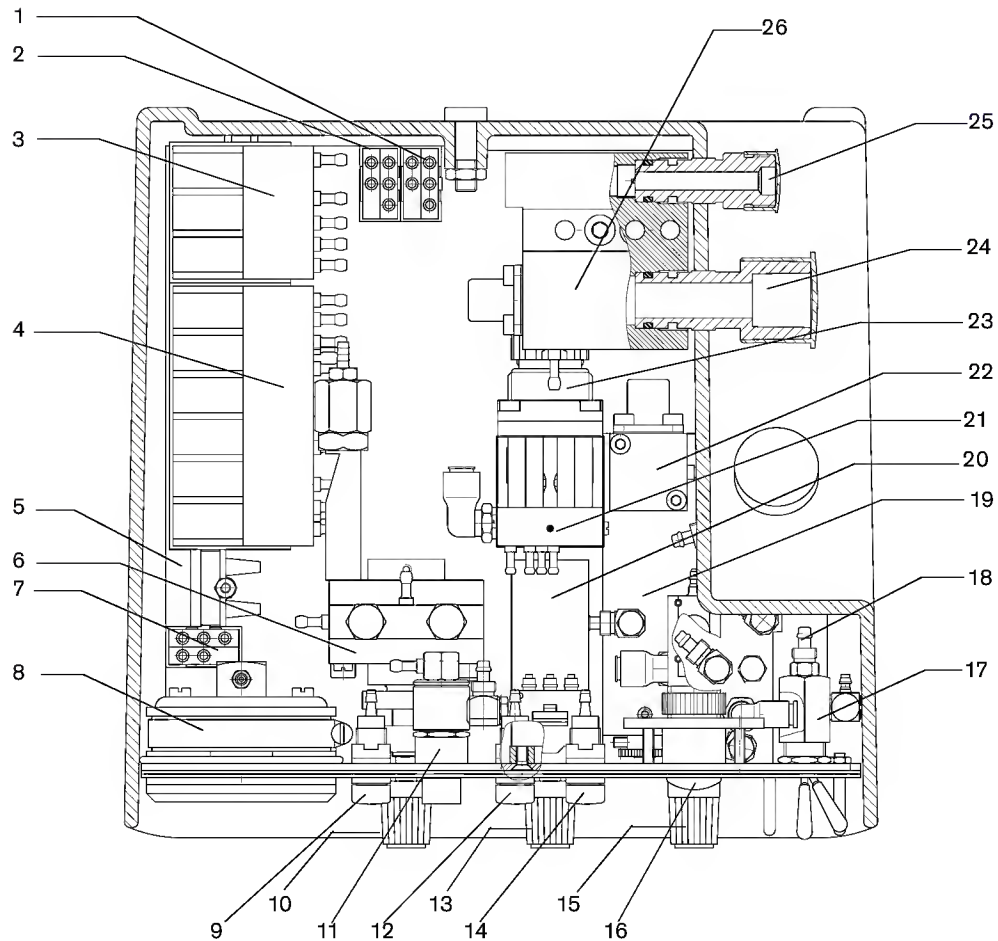


Fig. 20: Top view of the open Oxylog 1000 (new)

Key

1	3/2-way valve (DMR 8)	9	Indicator (Silence)	18	On switch
2	3/2-way valve (DMR 7)	10	Alarm control valve	19	Ventilator block
3	Alarm silence	11	Silence button	20	Frequency control
4	Alarm logic	12	Indicator (Paw low)	21	DMR1, DMR2
5	Volume (frequency)	13	Frequency control valve	22	Vent valve
6	Pressure sensor (double-diaphragm switch)	14	Indicator (Paw high)	23	Pressure regulator
		15	MV control valve	24	Patient connection port
7	DMR18	16	Indicator (Pv)	25	Gas connection port
8	Pressure gauge	17	Air Mix/No Air Mix	26	Patient block